



Biometric Technologies and Behavioural Security

Tutorial 1 - Machine Learning and Pattern Recognition recalls

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Course language: Python

Google Colab:

- is a free cloud service that supports free GPU
- uses Jupyter Notebook

You need:

- a Google account

The logo for Google Colab, featuring the word "colab" in a bold, lowercase, sans-serif font. The letters "c" and "o" are yellow, while the letters "l", "a", and "b" are orange.

Python Main Data Analysis Libraries





Image Processing in Python

OpenCV:

- is a cross-platform library
- focuses on image processing, video capture and analysis including features like face detection and object detection





Google Colab: how to read data from Google Drive?

<https://bit.ly/39hcTgB>

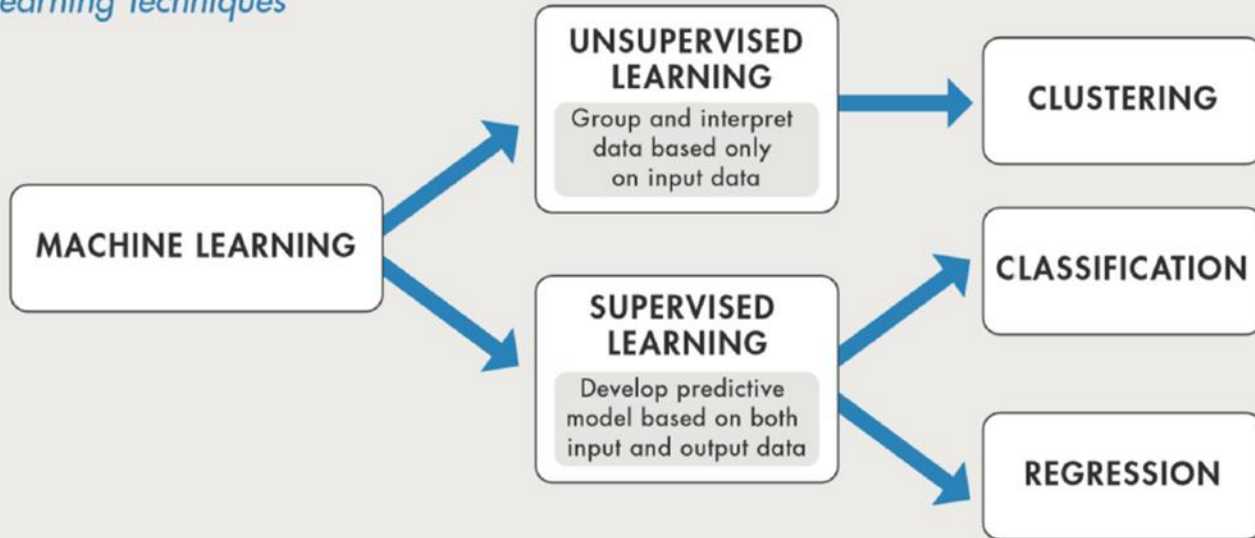


Machine Learning

Machine learning teaches computers to do what comes naturally to humans and animals: learn from experience. Machine learning algorithms use computational methods to “learn” information directly from data without relying on a predetermined equation as a model. The algorithms adaptively improve their performance as the number of samples available for learning increases.

Machine Learning Techniques

Machine Learning Techniques



MACHINE LEARNING

SUPERVISED LEARNING

UNSUPERVISED LEARNING

CLASSIFICATION

REGRESSION

CLUSTERING

Support Vector
Machines

Linear Regression,
GLM

K-Means, K-Medoids
Fuzzy C-Means

Discriminant
Analysis

SVR, GPR

Hierarchical

Naïve Bayes

Ensemble Methods

Gaussian Mixture

Nearest Neighbor

Decision Trees

Neural Networks

Neural Networks

Hidden Markov
Model



Machine Learning stages

1 - Data Collection

2 - Data Preparation

3 - Choose a Model

4 - Train the Model

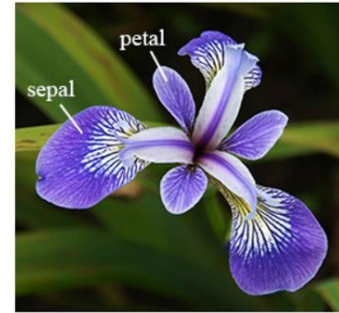
5 - Evaluate the Model

6 - Parameter Tuning

7 - Make Predictions

Machine learning recalls: classification of the Iris dataset

<https://bit.ly/2Ub1Ote>



An example of iris flower and the features of our model



Iris Setosa

Iris Virginica

Iris Versicolor

Images of the three classes of iris considered in this model



Try some other scikit-learn classifier

https://scikit-learn.org/stable/user_guide.html

Supervised:

- [Support Vector Machines](#)
- [Decision Tree Classifiers](#)
- [Naive Bayes](#)
- etc

Unsupervised:

- [K-means](#)
- [DBSCAN](#)
- etc

+ Plot a simple scatter plot of 2 features of the iris dataset.



Classification of the Iris dataset: unsupervised

<https://bit.ly/2ULQtzd>



Exercise

- Download the LFW facial dataset:

https://scikit-learn.org/stable/modules/generated/sklearn.datasets.fetch_lfw_people.html

- Divide into train and test
- View an image
- Train a classifier and predict test labels. Calculate accuracy.



LFW dataset

<https://bit.ly/2QEoWhG>

- Low accuracy using the whole image as feature vector and KNN classifier.
- It is important to have discriminative feature vectors.
- It is necessary to analyze the type of image to be classified.